

**REMARKS**

Claims 1-20 are currently pending, claims 8 and 18 being withdrawn from consideration.

***Allowable Subject Matter***

The Examiner is thanked for indicating that claims 2 and 12 contain allowable subject matter. However, applicants maintain the patentability of the base claim (claim 1) from which claim 2 and 12 depend. Accordingly, the Examiner is respectfully requested to review the following remarks and reconsider the rejection of claim 1.

***Election/Restriction***

Claims 8 and 18 have been withdrawn as being directed to patentably distinct species. Claims 8 and 18 depend from generic claim 1. As discussed in the following remarks, the Examiner is requested to allow generic claim 1. Upon allowance of generic claim 1, the Examiner is requested to consider claims 8 and 18 as provided by 37 CFR § 1.141.

***§103(a) - Spiekermann + Wu***

Claims 1, 3-7, 9 and 11 stand rejected under 35 USC § 103(a) as being unpatentable over Spiekermann (WO 02/103863) in view of Wu (USPN 5,278,852). Applicants traverse this rejection.

Spiekermann does not disclose or suggest each aspect of the presently claimed combination, as set forth in representative claim 1. For a first example, Spiekermann does not disclose or suggest that the pump source is arranged to optically pump *both the first and the second gain element*. Further for a second example, Spiekermann does not disclose or suggest that the first non-linear region for sum-frequency mixing and the second non-linear region for frequency doubling *are both located within the second (i.e. within the same) cavity*.

With respect to the first example, Spiekermann does not disclose or suggest that the pump source is arranged to optically pump *both the first and the second gain element*. Moreover, there is no reason one skilled in the art would modify Spiekermann to arrive at an arrangement with such a pump. A reason one would

not modify Spiekermann as such is that when one skilled in the art studies Spiekermann, and particularly Figure 1 thereof, one would immediately conclude that it is not feasible to use the claimed pump source that is arranged to optically pump both the gain elements. Not only is there no hint or suggestion towards using a single pump source, but it is also incompatible with the laser design presented in Spiekermann.

The Examiner is reminded that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *MPEP* § 2142 (citing *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). Accordingly, if the Examiner were to maintain the present rejection, the Examiner is respectfully requested to provide technical reasons why and how one skilled in the art would modify Spiekermann to include the claimed pump source. Applicants respectfully assert that there is no such reason to be found in the art, as the claimed pump is simply incompatible with the laser design presented in Spiekermann. Accordingly, the claimed invention is patentable over Spiekermann (and Spiekermann in view of Wu, as Wu does not remedy that the claimed pump source is incompatible with the laser design presented in Spiekermann, discussed below.).

With respect to the second example above, the Examiner has already acknowledged that there is only a single non-linear element disclosed in Spiekermann. Applicants highlight that Spiekermann completely fails to disclose or suggest not only the use of a second non-linear element, but also the idea of locating both the first and second non-linear elements within a common resonant cavity.

To remedy this deficiency of Spiekermann, the Examiner relies on Wu. However, applicants respectfully submit that one of ordinary skill in the art, turning to Wu, would **not** find guidance to supplement the disclosure of Spiekermann and therefore would **not** arrive at the claimed invention.

Wu aims towards producing high order harmonics in CW or low peak power pulse lasers. Wu discusses the use of at least two non-linear crystals within the resonating laser cavity. A first non-linear crystal is used for frequency doubling the fundamental frequency field, and a second non-linear crystal is used for sum-frequency mixing the fundamental frequency field with the frequency doubled field.

Additional non-linear crystals can be introduced according to Wu in order to produce even higher harmonics.

Wu discloses the use of a single resonating cavity in which there is located a single laser medium. Hence, in the technology according to Wu, there is only a single fundamental frequency field available for the non-linear conversion.

It is therefore clear that Wu fails altogether to disclose or suggest the idea of using a pump source that is arranged to optically pump both a first and a second gain element. Already for this reason, Wu cannot give the ordinary artisan any guidance towards the present invention in terms of using a single pump source for pumping both a first and a second gain element.

Moreover, the present invention employs a first non-linear optical region for sum-frequency mixing of radiation generated in a first resonant cavity and radiation generated in a second resonant cavity, wherein the first non-linear optical region is located within the second cavity. In addition, the second resonant cavity also includes, according to the present invention, a second non-linear element or region for frequency doubling of the radiation generated in the second cavity.

Since the technology of Wu uses only a single fundamental frequency field, there is no reason one skilled in the art would use a non-linear optical region for sum-frequency mixing of two fields generated in different resonant cavities.

The Examiner should further consider that Wu discloses a "serial" frequency conversion, in which the output of the first non-linear crystal is used as input to the second non-linear crystal. The present invention, however, relates to a "parallel" frequency conversion in which two processes (frequency doubling and sum-frequency mixing) take place in parallel to produce a dual-wavelength output from the laser arrangement.

Accordingly, it is clear that one skilled in the art, relying on Spiekermann and Wu, would not arrive at the present invention, as set forth in representative claim 1. The combination of Spiekermann and Wu does not disclose or suggest a pump source that is arranged to optically pump *both the first and the second gain element*. Such a pump source is incompatible with the laser design presented in Spiekermann. Further, in Wu, there is only a single fundamental frequency field available for the non-linear conversion -- meaning that the claimed pump source is also incompatible with Wu. The Examiner has not presented a teaching of the

claimed pump source. Further, even if the Examiner discovers such a reference, there is no certainly no reason why one skilled in the art would modify the combination of Spiekermann in view of Wu with such a pump source to arrive at the presently claimed invention.

Further, the combination of Spiekermann and Wu does not disclose or suggest the use of a second non-linear element, wherein both the first and second non-linear optical regions are located within a common resonant cavity. The Examiner admits that Spiekermann does not teach this. And, since the technology of Wu uses only a single fundamental frequency field, there is no reason one skilled in the art would use a non-linear optical region for sum-frequency mixing of two fields generated in different resonant cavities in Wu. Thus, the combination of Spiekermann in view of Wu does not arrive at the claimed invention, and there is no reason one skilled in the art would modify the combination to arrive at the claimed invention.

Thus, the Examiner has not presented a *prima facie* case of obviousness, and the rejection is respectfully requested to be withdrawn.

***§103(a) - Spiekermann + Wu + Byer***

Claims 10, 13-17, 19 and 20 stand rejected under 35 USC § 103(a) as being unpatentable over Spiekermann (WO 02/103863) in view of Wu (USPN 5,278,852) further in view of Byer (USPN 4,739,507). Applicants traverse this rejection.

The Examiner relies on Byer to allegedly disclose a dielectric coating. Without acquiescing to the alleged disclosure of Byer, or to the alleged combination of references, applicants respectfully submit that Byer does not remedy the deficiencies of Spiekermann in view of Wu, at least as described above.

Accordingly, the rejection is respectfully requested to be withdrawn.

***Conclusion***

For at least the reasons stated above, the Examiner is respectfully requested to reconsider and withdraw the outstanding rejections and objections, and to allow the present application.

In the event that there are any questions concerning this amendment, or the application in general, the Examiner is respectfully urged to telephone the undersigned attorney so that prosecution of the application may be expedited.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

A handwritten signature in black ink, appearing to read "T.D. Boone". The signature is written in a cursive, stylized font.

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By:

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